MEASUREMENT OF THE EFFECTIVENESS OF A SCREENING TOOL TO DETECT INJURIES AND IMPROVE READINESS AMONG COMBAT MEDIC STUDENTS

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Injury rates among Combat Medic Advanced Individual Training have been reported to be approximately 24% for men and 24-30% for women. The highest rate of initial injury incidence for men and women occurs during the first week of training, possibly due to students arriving with injuries or symptoms that can quickly progress to an injury. This evaluation was designed to assess whether early screening and intervention would reduce the number of students on limited duty profile, trim down limited duty days, or decrease end-of-cycle holdovers due to musculoskeletal injury. Early screening and intervention was defined as identifying and referring at risk students to health care professionals, prior to beginning traditional physical training. Students (N = 291) from one company were divided into three groups. Students from the first group was screened and referred for early evaluation and intervention by health care providers (HCP) using a newly developed screening tool. Students in the second group were screened by drill sergeants (DS) using the new tool. Those in the third group followed the traditional methods for entering the medical system. Results revealed that both HCPs and DSs could accurately identify students with injuries (92% and 80% respectively). The screening and referral process did not reduce the number of students receiving a limited duty profile, the length of the profiles, or the holdover rate ($p > 0.05$). Other findings included an overall injury rate of 34% with approximately 40% of injured students either arriving with an injury or sustaining an injury shortly after arrival. Although formal screening of students is not recommended, it is suggested that leaders encourage students to seek medical attention during the early part of their training for signs and symptoms indicative of injury

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Measurement of the Effectiveness of a Screening Tool to Detect Injuries and Improve Readiness Among Combat Medic Students

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TABLE OF CONTENTS

LIST OF TABLES

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EXECUTIVE SUMMARY

The purpose of this project was to assist the Commander of the 232nd Medical Battalion, Center Brigade, Ft. Sam Houston (FSH), in refining the administrative process of identifying new students that may need medical attention. Two goals were identified. The first goal was to improve the screening process used to identify "at risk" students prior to their beginning physical training at FSH. The second was to determine the effectiveness of alternative screening processes in reducing musculoskeletal clinic visits and lost duty time among 91B10 students.

Injury rates among Combat Medic Advanced Individual Training have been reported to be approximately 24% for men and 24-30% for women (Henderson, Knapik, Shaffer, McKenzie, and Schneider, 2000; Rice, Mays, and Connolly (2001). The highest rate of initial injury incidence for men and women occurs during the first week of training. The Drill Sergeants from 232nd Medical Battalion felt some students were arriving with injuries or symptoms and deciding to postpone medical attention so they could participate in the first physical fitness test, would not miss class for appointments, and could "phase" to achieve greater autonomy. This evaluation was designed to assess whether formalized early screening and intervention would reduce the number of students on limited duty profile, trim down limited duty days, or decrease end-of-cycle holdovers due to musculoskeletal injury. Early screening and intervention was defined as identifying and referring at risk students to health care professionals, prior to beginning traditional physical training. Students (N = 291) from one company were divided into three groups. Health care providers (HCP) used a

newly developed screening tool to screen 97 students, referring those with symptoms to the troop medical clinic (TMC) for early evaluation and intervention. Drill sergeants (DS) used the new tool to screen another 97 students, and a final 97 students followed the traditional methods for entering the medical system.

Results revealed that both HCPs and DSs could accurately identify students with injuries (92% and 80% respectively). The screening and referral process did not reduce the number of students receiving a limited duty profile, the length of the profiles, or the holdover rate ($p > 0.05$). Other findings included an overall injury rate of 34% with approximately 40% of injured students either arriving with an injury or sustaining an injury shortly after arrival. Although formal screening of students is not recommended, it is suggested that leaders encourage students to seek medical attention during the early part of their training for signs and symptoms indicative of injury.

1. BACKGROUND

The Commander of the 232nd Medical Battalion asked the Operation Aegis Injury Prevention Task Force to assist him in refining his administrative process for identifying incoming students at risk for a musculoskeletal injury. The project began with a review of existing data on the scope and nature of the problem.

Injury rates requiring outpatient medical evaluation, among soldiers in U.S Army basic combat training are reported to range from 26% to 27.4% for men and 51% to 54% for

women (Jones, Bovee, Harris, and Cowan, 1993; Jones, Bovee, and Knapik, 1992; Kowal, 1980). Risk factors for developing an overuse musculoskeletal injury among military soldiers include low levels of past physical activity and physical fitness (Kowal, 1980; Jones, Bovee, Harris, and Cowan, 1993; Jones, Cowan, Tomlinson, Robinson, Polly, and Frykman, 1993; Almeida, Maxwell-Williams, Shaffer, Brodine, 1999; Shaffer, Brodine, Almeida, Williams, and Ronaghy, 1999), high running mileage (Jones, Cowan, and Knapik, 1994) and sudden increases in the amount of physical exercise (Tomlinson, Lednar, and Jackson, 1987). A history of a previous injury is also a risk factor for future overuse injuries (Jones, Cowan, Tomlinson, Robinson, Polly, and Frykman, 1993; Almeida, Maxwell-Williams, Shaffer, Brodine, 1999). During Combat Medic Advanced Individual Training (AIT) at Fort Sam Houston (FSH), the incidence of musculoskeletal injuries (MSI) has been reported as 24% for men and 24 to 30% for women (Henderson, Knapik, Shaffer, McKenzie, and Schneider, 2000; Rice, Mays, and Connolly (2001). Among soldiers who receive medical attention for a MSI while attending Combat Medic AIT, 91% of MSIs are reported to occur while on duty, with slightly greater than 50% being associated with military physical training (37% with running, 13% with marching, and 5% with calisthenics) (Rice and Mays, unpublished data). The consequences of high injury rates include increased health-care costs, personnel restrictions that impede readiness and lead to indirect costs (i.e. salaries, housing and subsistence for students unable to perform their duties), disability payments, and possibly lower morale.

Combat Medic AIT (also called 91B10 training) is a ten-week course. The majority of students in this training program report directly from Basic Combat Training (BCT).

Shortly after arrival, these students take a diagnostic Army Physical Fitness Test (APFT). Scores on the diagnostic APFT are used to divide students into ability groups for physical training during the course. The APFT consists of a timed two-mile run, pushups and situps. Scores on the APFT are normalized according to age and gender. Students must pass the APFT with 50 points in each event in order to graduate from BCT, and with 60 points in each event in order to graduate from 91B10 training.

Students on profile (limited duty) for a musculoskeletal injury, are, in most cases, not permitted to take the APFT. If a student is unable to take and pass the APFT while at FSH, the student will usually be held-over (in some cases students are allowed to graduate with a waiver if they passed the APFT to the 60 point standard during BCT). Students are generally held-over until their injury is healed and they are able to pass the APFT. Infrequently, more severe injuries or injuries that respond poorly to treatment may result in medical board proceedings and discharge from the Army.

According to a recent medical record review, the highest injury rates among Combat Medic AIT students are seen during the first week of training, which could indicate that students are arriving with MSIs and immediately seeking medical evaluation and care (Henderson, Knapik, Shaffer, McKenzie, and Schneider, 2000). Cadre at FSH expressed concern that some students may arrive with MSIs and attempt to conceal their injuries in order to pass their APFT and advance through training. This practice might exacerbate these injuries and lead to prolonged duty restrictions. It was theorized that identifying students

with injuries early in their AIT training, and referring them for medical evaluation and treatment might result in fewer patient visits and decreased lost duty time.

The goals of this project were to 1) improve the screening process used to identify "at risk" students prior to their beginning physical training at FSH, 2) determine the effectiveness of alternative screening processes in reducing injuries and lost duty time among 91B students.

2. METHODS

Although this project was a program evaluation requested by the Commander of the 232nd Medical Battalion, not a formal research project, students were randomly assigned to three screening programs. The traditional screening process was used with one-third of the students, a standardized screening process performed by health care providers was used with one-third of the students, and a standardized screening process performed by Drill Sergeants was used with one-third of the students. Health care providers in the treatment facility were blind to the student's screening program. Data on the outcomes of the screening programs were extracted from existing company administrative databases. The project was conducted in accordance with the principles outlined in AR 70-25.

2.1. STUDENTS

Students, N = 291, attending the first week of Combat Medic AIT were stratified on the basis of gender, age, and basic training site and randomly assigned to one of three screening programs: Health Care Providers (HCP), n = 97, Drill Sergeants (DS), n = 97, and Traditional (T), n = 97. All students were from the same company and initiated training at the same time. Students who had previously served on active duty, students currently on profile, and students recycled from other companies were excluded from the screening process.

Because only the data needed for the evaluation of the screening programs were extracted, demographic data were not compiled on the students.

2.2. PROCEDURES

2.2.1. Pre-Physical Training Screen (Pre-PT Screen).

A Pre-PT Screen was designed by an Army Physical Therapist, and reviewed by Army Physical Therapists stationed at the U.S. Army Medical Department Center and School at FSH, Brooke Army Medical Center at FSH, and Keller Army Community Hospital at West Point, NY. The screening tool was intended for use by drill sergeants to detect students with pre-existing injuries. Identified students would then be referred to the Troop Medical

Clinic for formal medical evaluation prior to beginning physical fitness training with their unit.

Because it is impractical to have all students arriving at a new post screened by health care providers, the screening tool was designed to be administered by unit personnel (in this case drill sergeants) without formal medical training or equipment. To guard against any question of impropriety and for the sake of modesty, the screening could not require disrobing or physical contact between the screener and the student. The screening tool needed to be easy to administer, did not require any special medical training or equipment, and could not violate existing rules of conduct between the screener and the student.

The Pre-PT screen consisted of a series of questions followed by a series of functional assessment tests (See Attachment A-C). The questions were arranged in an algorithmic format. Students who reported symptoms consistent with injury were referred to the medical treatment facility without having to complete the functional assessment trials. Students who did not report symptoms or who reported mild symptoms but did not desire medical evaluation, continued through the screening process. Following the questions, students were asked to perform five functional assessment tests. Screeners looked for ability to perform each test, symmetry of movement, and indicators of discomfort or pain (facial or verbal expressions, joints 'giving'). Additionally, screeners inquired as to whether or not the student experienced pain with any of the movements. Inability to perform the test, lack of symmetry in movement, or reports of pain resulted in referral for medical evaluation.

In an attempt to control for variability among screeners, a single instructor trained all screeners in the screening process and each screener was observed while conducting practice screenings. Screeners were observed until they seemed comfortable and efficient. The instructor and other subject matter experts were available for assistance throughout the screening process.

The Pre-PT screen was fielded for the first time in C Company, 232nd Medical Battalion on 23 May 2000 and again on 27 May 2000. On the first day, 50 students were screened by eight health care practitioners (Occupational and Physical Therapists, Community Health Nurses, and a physical therapy technician) who were paired with and trained six drill sergeants. During the second day, 50 students were screened by six drill sergeants who were supervised by two health care professionals. The results of this field test revealed that drill sergeants were able to use the screening, but that some revisions were needed. Revisions were made and the project was initiated using the final version of the Pre-PT Screen.

2.2.2. Programs

HCP program screeners included an occupational therapist, two physical therapists, two registered nurses, a physician assistant, and a physical therapy assistant. The DS program screeners were Drill Sergeants from a different company than the students who were being screened, so that the student's immediate supervisors did not perform the screening. Students assigned to the T program were not screened, but were administratively processed

and allowed to seek care in the traditional manner. The traditional procedure is for a student to ask to go on sick call, be given a "sick slip" by unit personnel, and to be screened during sick call before the start of the normal duty day (between 0530 and 0700) on any week-day. Students needing medical care in the evenings or weekends report to the emergency room at Brooke Army Medical Department Center.

2.2.3. Dependent Measures

Students referred for medical evaluation during the screening process were said to have a positive test result. The positive result was considered confirmed if the student received a profile from a health care provider at the Troop Medical Clinic. Students not referred during the screening process were said to have a negative test result. The negative result was considered confirmed if the students did not seek medical evaluation within six working days of taking the Diagnostic APFT (DAPFT). The DAPFT was administered one week after the Pre-PT Screen.

2.2.4. Analysis

Data extracted from administrative databases were used to answer seven evaluation questions. Descriptive and inferential statistics were used to answer the questions. A p-value of < 0.05 was considered statistically significant.

1) Did screening correctly identify students who had a MSI?

2) Did screening increase the number of MSI profiles given early in training?

3) Did screening reduce the number of MSI profiles during the course?

4) Did screening reduce the average length of MSI profiles during the course?

5) Did screening increase the number of students who passed their RAPFT?

6) Did screening reduce the number of holdovers for MSI?

7) Did screening provide an estimate of the scope of the problem of MSI?

3. RESULTS

3.1. *Did screening correctly identify students who had a MSI?*

The relationship between screening results and outcomes is shown in Table 1. The negative predictive value of the screen in the HCP program was 91% and was 95% in the DS program. This result is an indication that screeners correctly identified healthy students who should take the DAPFT and begin regularly scheduled physical training. The screening method had a high specificity (99% for HCP and 98% for DS).

The positive predictive value of the screen was 92% for HCP and was 80% for DS. This result is an indication that screeners correctly identified students at risk who should be seen by a health care professional prior to taking the DAPFT or beginning physical training. The screening had modest sensitivity: 58% for HCP and 67% for DS.

Table 1. Relationship between Screening Results and Outcomes.

Health Care Provider Program (n = 97)	Confirmed	Not Confirmed	Correctly Identified
Positive Screen	11	1	11/12 (92%)[a]
Negative Screen	8	77	77/85 (91%)[b]
Correctly Identified	11/19 (58%)[c]	77/78 (99%)[d]	

Drill Sergeant Program (n = 97)	Confirmed	Not Confirmed	Correctly Identified
Positive Screen	8	2	8/10 (80%)[a]
Negative Screen	4	83	83/87 (95%)[b]
Correctly Identified	8/12 (67%)[c]	83/85 (98%)[d]	

[a] Positive Predictive Value
[b] Negative Predictive Value
[c] Sensitivity
[d] Specificity

3.2. *Did screening increase the number of MSI profiles given early in training?*

The purpose of the screening program was to increase the number of students diagnosed early, so that early treatment could reduce the negative impact of injuries. The T program resulted in 9% of the students having a profile prior to the DAPFT. In contrast, the HCP program resulted in 20% of students having a profile prior to the DAPFT, a 122% increase ($\chi^2(1) = 4.17$, $p = 0.04$). The DS program resulted in 12% having a profile prior to the DAPFT, a 33% increase ($\chi^2(1) < 1$ $p > 0.05$).

3.3. *Did screening reduce the number of MSI profiles during the course?*

In the T program 28% of students had one or more profiles after the DAPFT. In the DS program 26% of students had one or more profiles after the DAPFT, a 7% decrease in the profile rate ($\chi^2(1) < 1$, $p > 0.05$). However, in the HCP program 34% of students had one or more profiles after the DAPFT, a 21% increase in the profile rate ($\chi^2(1) < 1$, $p > 0.05$). Thus, the new screening programs were no better than the traditional program in reducing profiles during the course.

3.4. Did screening reduce the average length of MSI profiles?

The purpose of the screening program was to reduce the severity of injury by providing early treatment. Early diagnosis and treatment should reduce the length of profiles. During the ten-week course the average length of MSI profiles given was 22.45 days ($S = 18.01$, $n = 29$) in the T program, 21.25 days ($S = 15.64$, $n = 40$) in the HCP program, and 20.97 days ($S = 16.38$, $n = 30$) in the DS program. Neither the HCP program nor the DS program was significantly different from the T program ($t(67) = -.30$, $p > 0.05$ and $t(57) = -.33$, $p > 0.05$, respectively).

3.5. *What is the rate of severe MSI during 91B training and where are the injuries occurring?*

One of the goals of the screening program was to determine if providing early evaluation and treatment would reduce the severity of injury. Early diagnosis and treatment should provide students with time to improve their health and prepare for the RAPFT. Table 2 shows a comparison of RAPFT pass rates in the three programs. The data in this table show that students identified as injured or at risk for injury in the first week of training had substantially lower pass rates at the end of training than their uninjured colleagues. For example, in the HCP program only 58% of the injured or at risk students passed the RAPFT, while 86% of the uninjured students in the program passed the RAPFT. This pattern was true regardless of which screening program was used or which method was used to calculate the screening rate (number referred or number on profile before DAPFT). The table also shows that the pass rates of those identified as injured were not significantly different across the screening programs (ranging from 42% to 55% of students on profile prior to the DAPFT). These results suggest that all three screening methods identified students with genuine problems, but that early screening/treatment was not sufficient to solve the problems of these students.

Table 2. RAPFT Pass Rates across Screening Programs

	Referred at Screening	Passed RAPFT [a,b]	Not Referred at Screening	Passed RAPFT	$\chi 2$ p value
Health Care Provider Program (n = 97)	12	7 (58%)	85	73 (86%)	= 0.02
Drill Sergeant Program (n = 97)	10	5 (50%)	87	73 (84%)	= 0.01
Traditional Program* (n = 97)	9	5 (55%)	88	74 (84%)	= 0.04

*self-referral prior to DAPFT

[a] $\chi 2$ comparing pass rate of HCP profile students to T profile students, $p > 0.05$

[b] $\chi 2$ comparing pass rate of DS profile students to T profile students, $p > 0.05$

	Profile before DAPFT	Passed RAPFT [c,d]	Not Profile before DAPFT	Passed RAPFT	$\chi 2$ p value
Health Care Provider Program (n = 97)	19	9 (47%)	78	71 (91%)	< 0.001
Drill Sergeant Program (n = 97)	12	5 (42%)	85	73 (86%)	< 0.001
Traditional Program (n = 97)	9	5 (55%)	88	74 (84%)	= 0.04

[c] $\chi 2$ comparing pass rate of HCP profile students to T profile students, $p > 0.05$

[d] $\chi 2$ comparing pass rate of DS profile students to T profile students, $p > 0.05$

3.6. *Did screening students reduce the number of holdovers for MSI?*

The purpose of the screening program was to increase the number of students diagnosed early, so that early treatment could reduce the negative impact of injuries. In the T program 4% of students were held-over for MSI. In the HCP program 6% of students were held-over for MSI (HCP v T: $\chi^2(1) < 1$, $p > 0.05$) and in the DS program 2% were held-over for MSI (DS v T: $\chi^2(1) < 1$, $p > 0.05$). It is important to note that in all three programs, 50% of the holdovers for MSI had been given a profile prior to the DAPFT. These results suggest that all three programs produced an equivalent number of holdovers and that the screening process identified students with genuine problems, but was not sufficient to solve the problems of these students.

3.7. *Did screening provide an estimate of the scope of the problem of MSI?*

This program evaluation provided an in-depth look at the prevalence of MSI in Combat Medic AIT. In this group of 291 students, 99 (34%) had one or more profiles during the course. The average length of a profile during the course was three weeks ($\underline{M} = 21.52$, $S = 16.42$). Thus, one-third of the students spent an average of almost a third of the course (3 of 10 weeks) on limited duty. These data make it clear that MSI have a substantial negative impact on training readiness.

Of the 99 students on limited duty during the course, 40 were on profile for a MSI prior to the DAPFT. Thus, 40% of the students on profile in the course arrived at training

injured or were injured in the first week of training. Furthermore, of the 40 students who were on profile early in training, only 48% were able to pass their RAPFT. In contrast, of the 59 students on profile later in the course, 80% were able to pass their RAPFT. These statistics suggest that injuries that were identified early in training had more serious consequences than those identified later in training.

4. DISCUSSION

This project was designed to examine administrative methods of identifying new students who may need medical intervention. The first objective of this project was to develop a standardized screening tool and test its effectiveness. The new screening tool had good positive predictive value, negative predictive value, sensitivity, and specificity when administered by either health care providers or drill sergeants. The second objective was to determine whether early diagnosis and treatment using the new screening tool would positively impact training readiness. The new screening program was not noticeably better than the traditional program in reducing the number of profiles for MSI, reducing the length of profiles for MSI, increasing the number of students passing the RAPFT, or reducing the number of MSI-related holdovers. This was true regardless of who used the screening tool (health care providers versus drill sergeants).

Careful study of the screening process and its outcomes highlighted the serious nature of the problem of MSI. Injury rates during Combat Medic AIT were considerable (about 34% in this class) and resulted in substantial limited duty time (an average of three weeks in

this class). Approximately 40% of those injured either came to FSH with an injury or sustained an injury shortly after arrival. The injuries identified early in training appeared to be more debilitating than those that occurred late in training. These statistics suggest that leaders should encourage new students with symptoms of MSI to seek care immediately, and that they are doing so.

Each student speaks with a Drill Sergeant during their in-processing into the unit. The Drill Sergeant reviews their records and frequently will ask about their health and physical readiness. The initial APFT is not given until approximately eight to ten days after students have arrived at FSH. This also gives the Drill Sergeants time to observe students' performance during physical training sessions. It appears the informal mechanisms of speaking with and observing the students, as well as explaining that students should seek care if they need it, is working well to identify those students who need care.

4.1. Study Limitations

A review of the completed screening forms revealed some variability between screeners. That is, some screeners referred individuals based on "semi-affirmative" answers or difficulty (but not inability) performing the tests, while others did not. Health care providers, when assessing patients, generally used some degree of judgment. If a screening tool were to be used routinely, training should include videotaping several individuals as they are screened (some with disability, some without), having screeners review and score the

taped results, and permitting only those screeners that attained a certain "score" to function as screeners. In this way, a high degree of inter-rater reliability could be achieved.

This was locally designed utilitarian project designed to address an administrative issue, rather than a large-scale research project. It may be that involving a larger population or a different screening process would produce different results.

8. CONCLUSION

The use of the formal standardized screening tool, as presented in this article, is not warranted for screening new students. Use of the screening tool did not result in decreased lost duty time or improvements in performance, and its use was more time consuming for unit personnel than the traditional method of screening.

6. RECOMMENDATIONS

1) During in-processing drill sergeants should use questions similar to those in algorithm portion of this screening and refer students with affirmative responses for evaluation by health care professionals.

2) Cadre should observe newly arriving students carefully for signs of MSI. Students who appear to have difficulty marching or performing physical training should be asked about symptoms of MSI and referred as appropriate.

3) Cadre should be commended for their skills in identification and referral of soldiers through observation and interview. Cadre should be educated in risk factors known for their population, so they can include them in the interview process.

5. REFERENCES

Almeida, S.A., Maxwell-Williams, K., Shaffer, R.A., and Brodine, S.K. (1999). Epidemiological patterns of musculoskeletal injuries and physical training. Med Sci Sports Exer, 31, 1176-1182.

Jones, B.H., Bovee, M.W., Harris, J.M., and Cowan, D.N. (1993). Intrinsic risk factors for exercise-related injuries among male and female Army students. Am J Sports Med, 21, 705-10.

Jones, B.H., Bovee, M.W., Knapik, J.J. (1992). Associations among body composition, physical fitness and injury in men and women Army trainees. In B.M. Marriot and J. Grumstrup-Scott (Eds.). Body Composition and Physical Performance. Washington, DC: National Academy Press, 141-173.

Jones, B.H., Cowan, D.N., and Knapik, J.J. (1994). Exercise, training, and injuries. Sports Med, 18, 202-214.

Jones, B.H., Cowan, D.N., Tomlinson, J.P., Robinson, J.R., Polly, D.W., Frykman, P.N. (1993). Epidemiology of injuries associated with physical training among young men in the Army. Med Sci Sports Exer, 25, 197-203.

Kendall, F.P. and McCreary, E.K. (1983). Muscles Testing and Function, 3rd Ed., Williams and Wilkins: Baltimore.

Kowal, D.M. (1980). Nature and causes of injuries in women resulting from an endurance training program. Am J Sports Med, 8, 265-269.

Magee, D.J. (1997). Orthopedic Physical Assessment, 3rd ed., WB Saunders: Philadelphia.

Shaffer, R.A., Brodine, S.K., Almeida, S.A., Williams, K.M., Ronaghy, S. (1999). Use of simple measures of physical activity to predict stress fractures in young men undergoing a rigorous physical training program. Am J Epidemiol, 149, 236-242.

Tomlinson, J.P., Lednar, W.M., Jackson, J.D. (1987). Risk of injury in soldiers. Military Medicine, 152, 60-64.

PRE-PHYSICAL TRAINING SCREENING INSTRUCTIONS
Attachment A

1. Complete the Initial Screening Questions

   a. All students must complete the following demographic information:
      1) Name
      2) BCT/Prior duty station
      3) Current company and battalion

   b. All examiners (health care personnel or cadre) must complete the initial screening questions, arranged in a flowchart format. (Attachment A)

   c. Ensure that students are not experiencing pain, particularly in the hip area. If a student admits to pain **DO NOT** proceed with the remainder of the exam.

2. Perform the physical screening of the upper and lower extremities (**DO NOT** perform the screen on any student referred to the TMC, based upon answers to the initial screening questions).

   a. Upper Extremity:

      1) **Push-ups with a "plus"**

         a) Ask the student to assume the push-up position.

         b) Instruct the student to perform 3-5 wide-arm push-ups with a "plus", slowly. When the student reaches the "up position", instruct him/her to "attempt to push through the floor". This effort will allow the shoulder blades to move laterally (away from the spine) along the rib cage.

         c) Observe the student for the following:

            (1) Symmetry of movement in the wrists, elbow and shoulders. Are both arms moving together through the same amount of motion?

            (2) Does one or both shoulder blades appear to be lifting away from/off the rib cage?

               (a) If so, this is called a "winging scapula" (See photo in Kendall and McCreary, 1883, p 120 or sketch in Magee, 1977, p 184).

               (b) If this condition is observed, refer the student to the TMC upon completion of the screening.

            (3) Pain – ask the student if she/he is experiencing pain with the push-ups.

d) Document your findings on the screening form (Attachment B).

b. Lower Extremity

1) **Heel Drop**:

a) Ask the student to stand on toes and drop onto heels.

b) Inquire as to whether or not the student experienced any pain when dropping onto heels, especially in the hip. If the student complains of pain in the hip or lower extremity with this movement, **DO NOT** proceed with the following test.

c) Document your findings on the screening form (Attachment B).

2) **Duck Walk**:

a) Ask the student to assume a squat position with both feet pointed straight ahead.

b) Instruct the student to "duck walk" forward approximately 10 feet in a heel-to-toe fashion, turn around, and return to the starting position.

c) Observe the student for the following:

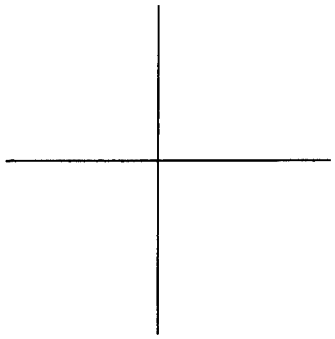
(1) Symmetry of movement in the ankles, knees and hips. Are both legs moving through the same amount of motion?

(2) Pain – ask the student if she/he is experiencing any pain during that activity. If so, ask where she/he is experiencing pain.

d) Document your findings on the screening form (Attachment C).

3) **Box Hop**:

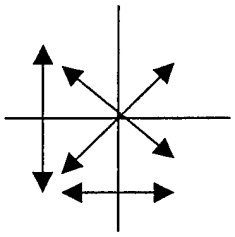
a) Set-up: Using (2) 1" strips of tape, approximately 20" long, make a cross on the floor as diagramed below.



b) Instruct the student to stand on one foot, starting in any of the four squares just outlined with the tape.

(1) Ask the student to perform a single leg hop, 2-3 times, in the following directions:

-Forward and backward
-Side to side
-Diagonally right to left
-Diagonally left to right



(2) Repeat on the opposite leg.

c) Observe the student for the following:

(1) Symmetry of movement – comparing vertical height and coordination, from one leg to the other.

(2) Pain – ask the student if she/he is experiencing any pain. If so, ask where she/he is experiencing pain.

d) Document your findings on the screening form (Attachment B).

4) **Heel Hop**:

a) Ask the student to remove both shoes and socks.

b) Instruct the student to hop 3-5 times on the heel of one foot. (WARNING: Inform the student that this may be uncomfortable on a hard floor. Therefore, she/he should not attempt to hop high into the air.)

c) Ask the student if she/he experienced any pain with that test and if so, where. (Some mild discomfort in the heel is expected.)

d) Document your findings on the screening form (Attachment C).

3. Review the Screening Form

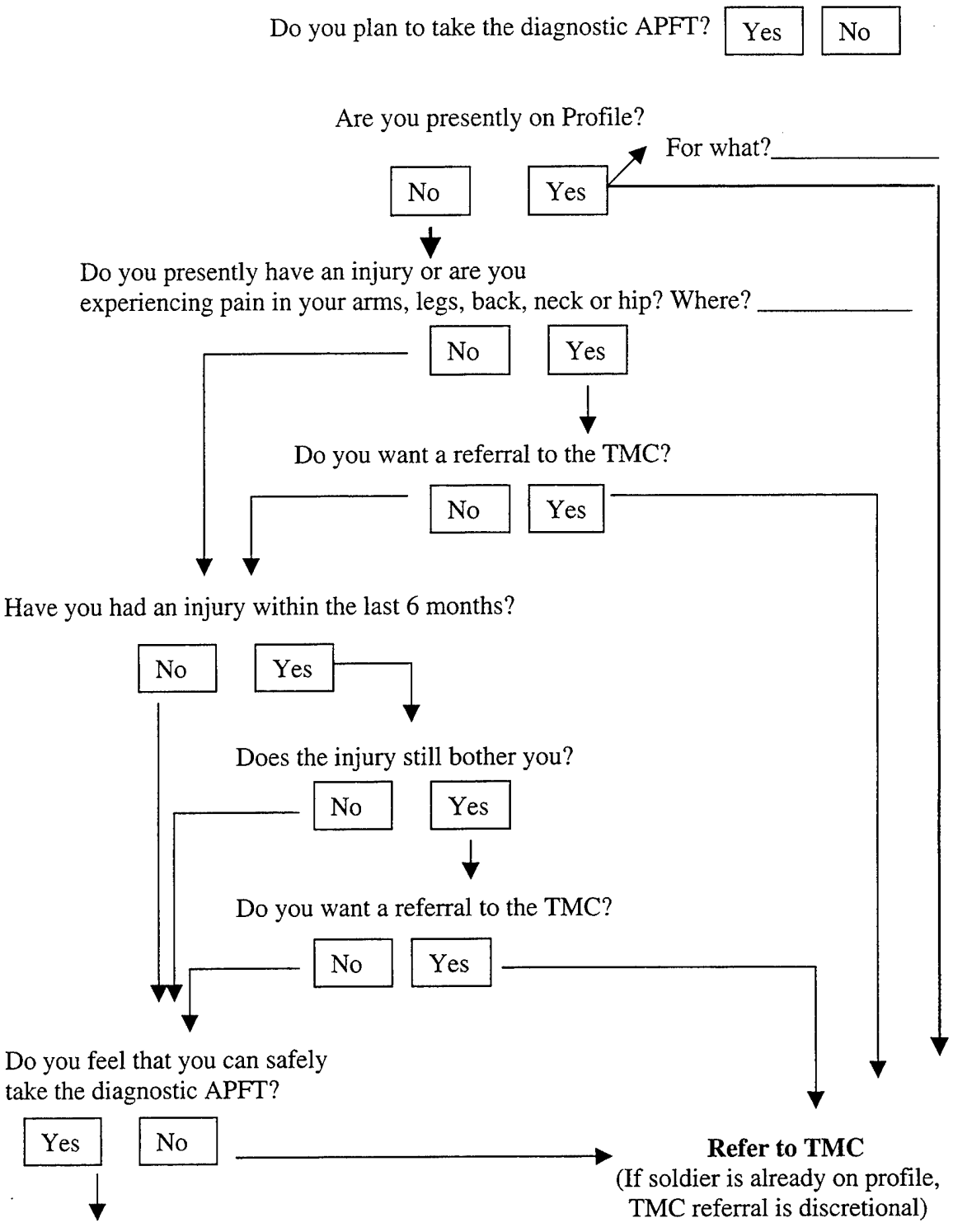
a. If all answers were "No", release the student back to his/her unit.

b. If any answer was documented as "Yes", perform the following:

1) Complete a DA 689 (Sick Slip), as provided by Operation Aegis, and refer the student to sick call.

2) Keep a roster of all students referred to the TMC.

INITIAL SCREENING QUESTIONS (Attachment B)



1.1 Perform the Complete Screen

PRE-PHYSICAL TRAINING SCREENING RESULTS
(Attachment C)

Date:_____
Name:_____ Rank:_____ SSN:_____

1. **Push-up Plus**	Yes	No
a. Lacks symmetry of movement?	O	O
b. Winging Scapula?	O	O
c. Pain?	O	O
2. **Heel Drop**		
a. Lacks symmetry of movement?	O	O
b. Pain (Where?_____)	O	O
3. **Duck Walk**		
a. Lacks symmetry of movement?	O	O
b. Pain (Where?_____)	O	O
4. **Box Hop** (Fwd, Bwd, Side-to-Side, Diagonal)		
a. Pain (Where?_____)	O	O
b. Lacks symmetry of movement? (i.e. vertical height, coordination)	O	O
5. **Heel Hop** (~5 repetitions)		
a. Pain in leg?	O	O
b. Lacks symmetry of movement?	O	O

6. **Record** the results of each screening on the master roster. Be sure to annotate why you referred the soldier (which test specifically).

7. If any answer was documented as yes, **complete a DA FM 689** (Sick Slip) and refer the soldier to sick call.